IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
Norfolk Division

R.M.S. TITANIC, INC.,
successor-in-interest to
Titanic Ventures, limited partnership,
Plaintiff,

v.

Civil Action No. 2:93cv902

THE WRECKED AND ABANDONED VESSEL, ITS ENGINES, TACKLE, APPAREL, APPURTENANCES, CARGO, ETC., LOCATED WITHIN ONE (1) NAUTICAL MILE OF A POINT LOCATED AT 41 43' 32" NORTH LATITUDE AND 49 56' 49" WEST LONGITUDE, BELIEVED TO BE THE R.M.S. TITANIC
in rem,
Defendant.

DECLARATION OF DAVID LOVALVO

I, David Lovalvo, pursuant to 28 U.S.C. § 1746, declare under penalty of perjury that the following statement is true and correct.

1. I am the Founder, President and CEO of the Global Foundation for Ocean Exploration, a non-profit organization whose mission is to develop the capabilities, tools, expertise and relationships necessary to explore and to enhance public awareness and appreciation of the world's underwater environments. I have been involved in ocean science and exploration for over 40 years. My educational background, which consists of formal and on the job training, is in deep saturation diving systems, underwater salvage and manned submersibles. Past affiliations include Dr. Robert Ballard's Institute for Exploration as an Adjunct in Engineering; Adjunct in Engineering at the University of Rhode Island's Department of Ocean Engineering; and Adjunct in Engineering at Woods Hole Oceanographic Institution.

2. I hold Professional Licenses in Commercial Deep Sea, Mixed Gas/Saturation, Shallow Water, and Instructor Dive Certifications; 2) Alvin Deep Diving Submersible: Certified by the U.S. Navy and Woods Hole Oceanographic Institution (Inactive); 3) U.S. Coast Guard: Unlimited Passengers/100 Gross Tons; and 4) Master Electrician. Over the years, I have worked with many organizations involved in deep sea exploration and activities, including the Woods Hole Oceanographic Institute and the National Oceanic and Atmospheric Administration (NOAA). I am currently working with NOAA, pursuant to a grant, and am responsible for all design, fabrication and operational aspects of the NOAA Ocean Exploration Program's deep submergence robotic equipment, including all

staffing, training and oversight of a team of 30 multi-disciplined engineers, and the operation of all deep submergence equipment used for exploring the world's oceans.

3. NOAA has asked me to review and provide input on the sufficiency and adequacy of the "RMS *Titanic* Expedition 2020 Research Design." In addition to the Research Design, I have also reviewed: a March 27, 2020 memorandum provided by RMST to the Court with the Research Design; prior materials submitted by RMST to the Court that outline RMST's plan; NOAA's response to these earlier submissions; and, the transcript from a hearing held on February 20, 2020. I am not being compensated for my review of this plan.

4. My opinions are based on over 40 years in the business of designing, building and operating deep submergence systems, as well as participating in and managing numerous offshore operations related to salvage of downed aircraft, sunken ships, recovery of archaeological artifacts and support of significant scientific operations to depths of 6000 meters. I have extensive experience in ROV operations and have piloted highly sophisticated unmanned vehicles and their associated ancillary systems, including long and ultrashort navigation systems used for tracking underwater vehicles, state of the art camera and lighting systems used for documenting underwater features, as well as sunken vessels and lost aircraft, and have many years of experience operating very sophisticated hydraulic controlled, force feedback manipulators. I currently manage all technical operations (ROVs, telepresence, data management, and film production) for the NOAA Office of Ocean Exploration and Research (OER) onboard the NOAA Ship *Okeanos Explorer*, as well as other projects for the NOAA Office of National Marine Sanctuaries, and other non-government organizations. I oversee and manage personnel training for NOAA's unmanned vehicles and develop *Standard Operating Procedures* for all of NOAA's deep submergence activities. In 2004, I was part of the team that NOAA and the Institute for Exploration assembled to film *Titanic,* where we used the ROV *Hercules* to document the condition of the shipwreck and the extent of the debris field. I was one of three pilots that operated the ROV system on that project.

5. Based on my review of the Research Design, RMST has three primary goals: 1) conduct video surveillance of the interior and exterior of the portion of the shipwreck's hull containing the Marconi Suite; 2) conduct artifact recovery from the debris field; and 3) recover artifacts from within the Marconi Suite by gaining access through either the existing skylight opening, or if that is not feasible, cutting a hole in the upper deck above the Marconi Suite. My evaluation of the Research Design is detailed below. My comments and opinions are exclusively focused on how RMST's Research Design would be accomplished, and the potential consequences if pursued, and limited to the points discussed below. If I do not address a particular point, it should not be assumed that I agree or disagree with the position or approach RMST advocates for. I defer to the Court and offer no opinion on whether the activity proposed should be permitted.

6. The proposed video surveillance of the Marconi Suite is missing some information that would be helpful to obtain and assess, such as how RMST will initially film and evaluate the interior spaces of the areas they wish to effect recoveries from, and what points of

entry to these areas RMST anticipates using. As an example, do they intend to mount a camera and lighting system on the ROV manipulator(s) (e.g., wrist camera?)? If so, how close can they get to the areas of interest if the point of entry is the skylight? Are they planning on using a smaller ROV tethered to the larger ROV that can "fly" into the spaces desired? If so, it would be valuable to have the details on such a vehicle and how they would handle potential fouling inside the wreck. In either case, the potential for disturbing the sediments inside may hamper the ability to collect usable images. For video surveillance, and if done carefully by experienced pilots, the potential for damage while collecting the images would be mostly limited to the manipulator hitting the edges of the opening, or disturbing something inside the room due to lost visibility. The other potential for damage would be associated with the upper decking of the Marconi suite. During the imaging, if the ROV is to be stabilized on the upper decking, there could be some damage to the already fragile state of that decking.

7. Although I do not have significant concerns with the proposal to recover objects within the debris field, it would be valuable to have more information on the recovery baskets RMST intends to utilize and how this basket will be launched and recovered. As an example, will RMST free drop the basket to the bottom (hope not); or lower it down on a cable and use the ROV to guide it to a safe landing spot away from the wreck; or carry it down on one of the two ROV's they are proposing to utilize? The basket specification, pictures and/or computer-aided design (CAD) models would help provide a sense of how safe from damage the artifacts would be during ascent and recovery in rough seas. CAD models generally can provide much more design detail than a picture, since you can rotate the model in all planes and, therefore, visualize the effectiveness of the design. How RMST deploys the basket would provide a sense of the level of control they will maintain, so it does not end up hitting the wreck when reaching the bottom. Knowing how RMST will retrieve the basket will provide a sense of how safe the artifacts would be from loss during the water/air interface recovery process.

8. It is also important, not just for this objective but for all three objectives, to see a complete list of specifications of the ROVs RMST will be utilizing. One important aspect of the specification is the make and model of the manipulators RMST would be using on the ROVs. The dexterity of the arm, number of functions, type of hydraulic control, and force feedback potential (if any) are important attributes for recovering sensitive artifacts when thinking about these artifacts as "archaeological" in nature. Knowing this information can also help assess the potential damage the actions may cause.

9. Retrieval of artifacts from the Marconi Suite presents the biggest challenge and the greatest risk for damage to the wreck and its features. For clarification, the Research Design proposes artifact recovery from the Silent Room and/or the Marconi Room. The primary proposed point of entry for artifact recovery is the skylight. I would like to see the dimensions of the skylight opening and the "known" distance from that opening to the Silent Room to assess the feasibility of the artifact recovery and what damage might be expected. I would also need to know if any of the existing holes in the upper decking of the Marconi Suite are directly above the Silent Room and their sizes. This is hard to

discern from the pictures provided. If any existing holes in the decking are to be enlarged, or new holes cut, in an effort to access artifacts, what will be done with the decking material removed? Also, given the current condition of the upper decking RMST has reported, what potential damage does RMST envision occurring to the existing deck during the cutting and removal of deck plating and eventual recovery of artifacts? If I were attempting this project, the first thing my engineers would do is model the artifact recovery operations using CAD, which would show not only the geometry of how the manipulators could reach in and recover artifacts from different entry points, but also show the loads imposed on the upper deck as recovery was being performed. I would want to know well beforehand what my potential for success was going to be and what potential damage I might do given different scenarios.

10. From the information currently provided, and some speculation on what manipulators RMST might be using on the ROV, I have doubts on the ability for the manipulator to reach both horizontally and vertically far enough into the wreck to access the Silent Room from the skylight opening. I would need to see the specifications (dimensions, weight) on the motor generator unit RMST wishes to retrieve. Given the estimated distance between the skylight and the motor generator unit's location within the Silent Room, and the estimated reach and geometry of a logical manipulator, I have doubts as to whether or not the motor generator unit could be retrieved using the skylight opening as the entry point. Further, the motor generator unit was/is bolted to the decking. It is extremely doubtful that these bolts could be accessed, let alone removed traditionally. It is highly likely that the unit would have to be forcibly wrenched from its mounts. This would not be what I would consider a "surgical" removal, as damage to the deck or mounting bracket is certainly possible. Whether this amount of damage to an area already in very bad condition would be a concern, would be up to the Court. Even if the motor generator could be reached from the skylight opening and removed from its mounting, there is further doubt that it would fit through the skylight opening using the logical lifting points shown on the individual motor and generator components.

11. It should also be noted that a "Work Class" ROV system, as is described as being representative of what will be used, is a fairly large vehicle. Although the specifications of these vehicles have not been provided, I would suspect the vehicles proposed are at least 12' long and 6' to 8' wide. Their hydraulic propulsion systems may be in the range of 150-250 horse power and their air weight in excess of 9,000 pounds. If the specifications verify my assumptions, these are very powerful vehicles developed to do heavy salvage and offshore oil work. Although the air weight in water is not a factor, the power these types of vehicles can generate through downward thrust could inflict some level of undesirable loading on the already deteriorating upper deck of the Marconi Suite. Given the physical footprint of the ROV, and the anticipated downward thrust required to stabilize the vehicle during recovery of artifacts, the level of upper deck "point loading" by the forward section of the ROV skid could be increased substantially. As an example, let us assume the motor generator set is not only inherently heavy, but is also bolted to the interior decking which is over 7 feet below the upper decking. Reaching down into the Silent Room with the manipulator and exerting the upward force necessary to break the unit free of its mounts, and then lifting it out of the room, could possibly transmit

enough force to the ROV as it sits on the upper decking to cause a collapse. Have these forces been estimated and considered and if so, can RMST provide this information? Does RMST have a plan to mitigate this risk?

12. In further addressing the potential for damage to the wreck while removing artifacts from the Silent Room and/or the Marconi Room, one has to consider the nature of the effort required. It is highly unlikely that one will be able to reach in and gently remove artifacts. As noted in RMST's documents, based on previous interior surveys, the internal areas of these rooms are already in a significant state of deterioration. I suspect that gaining access to these artifacts will require a fair amount of debris to be moved around and/or broken up in order to gain the access they need. Further to this, the proposal is also calling for "removal" of material through use of a suction device. If sediment and small material are to be removed from the Silent Room and Marconi Room spaces by a suction system, where will this material be deposited? On the ROV? In the artifact baskets? Is a capture system planned? If deposited into the artifact basket, where will that basket be staged? On the wreck? Also, it would be valuable to see the design specifications on the suction system. The possibility of damaging or losing valuable and delicate artifacts that one might not see when removal is effected is very real.

    Spreading debris on the outside of the wreck or staging a capture basket on the wreck could have undesirable outcomes to the appearance of the wreck or create some level of damage to the already fragile upper deck plating. The plan does not appear to provide any information about this.

13. Although this may not be anticipated, what is the plan if human remains are encountered? There should be careful thought given as to how something like this would be handled. More often than not, this kind of situation can cause serious criticism and concern and can bring an abrupt halt to a major operation like this. Something like this could also adversely affect all further activity on this wreck, be it additional recovery requests or future science and educational aspects that may be more favorable to the Court.

14. Given the importance of this project, I do not see how all interested parties are provided the opportunity to guide the decisions at sea. The Research Design has few details on how those decisions would be made, and I suspect it would be very difficult for the Court (and other) representatives on the ship responsible for overseeing and evaluating the day to day plans and decisions to influence questionable decisions and provide proper oversight of the Court's wishes. Technology exists to arrange point to point live streaming of the entire operation, giving a voice to the abundance of expertise available to make careful and balanced decisions. This would help to ensure that any attempt to proceed with a questionable activity was properly vetted.

4-27-20
Date

David Lovalvo, President

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Professional Experience

2015 - Present: The Global Foundation for Ocean Exploration – Founder/President. Developed multiple formal partnerships including NOAA's Office of Ocean Exploration and Research, NOAA's National Marine Sanctuaries and NOAA's Office of Marine and Aviation Operations. Lead a team of 25-30 engineers, filmmakers, and data managers in the design, build, operation and maintenance of underwater vehicles and shipboard VSAT systems with diverse applications. Manage technical operations (ROV's, telepresence, data management, film production) for the NOAA Ship *Okeanos Explorer*, the National Marine Sanctuaries, and other non-government entities.

2008 – 2015: ROV Operations for Ocean Exploration

- *Consultant/ Program Manager - NOAA OE Deep Submergence Group* – design, build, operate and maintain new two body 6000m ROV Systems. Develop a long term staffing plan for the *Okeanos Explorer*; oversee and manage system integration, operation and training programs. Develop spares and consumable lists; and develop SOP's (Standard Operating Procedures) for all deep submergence activities.
- *Consultant/NOAA OMAO Group* - trained ship officers and support personnel in the launch, recovery and operational procedures of at-sea ROV operations.
- *Partner and co-PI* with 1) Yellowstone National Park, Craig Venter Institute and MT State U on Moore Foundation grant for biodiversity studies in Yellowstone Lake.
- *Consultant, pilot-technician* to IFE/NOAA OE on geological projects in the Black Sea, Mediterranean Sea, and the Sea of Crete; and archeology cruises to the Black Sea and other areas. ****Use of telepresence was a major aspect of this project.**
- *Consultant, pilot-technician, expedition leader* to IFE/OE 1) on deep-water corals project in the north Atlantic; 2) for support of a geology-microbiology project in the "Lost Cities" area of the north Atlantic. ****This was the first scientific ROV cruise guided by scientists entirely through use of telepresence**;
- *Consultant, pilot-technician, operations manager* to IFE/OE for support of a National Geographic/OE documentary on the present condition of the RMS Titanic. ****Use of telepresence was a major aspect of this project.**
- *Contractor/Co-PI, Consultant/subcontractor, expedition leade*r to the URI and OE to supply ROV operations using Eastern Oceanics work class/science class ROV "Oceanic Explorer" to explore, sample and photo-document the recently active volcano "Kick'em Jenny". *Consultant, pilot-technician* to IFE/OE on search and discovery of John Kennedy's PT109
- *Consultant, pilot-technician* to WHOI on JASON operations for hydrothermal vent work

Design/Fabrication/Installation of Equipment to Support Research Operations 1976 – 2008

- *Consultant/sub-contractor to private companies, private institutions, universities and government*: designed, fabricated and/or supplied an array of science tools for interface to large, work-class/science class ROV systems for offshore, deepwater science projects. Tools

include suction samplers; box cores; tube cores; majors and double majors; TI bottles; colonization trays biological boxes; hydraulically actuated grab samplers and biological boxes; probes for temperature, pH, DO, and CO_2; micro profilers; computer controlled micro profiler delivery systems; water sampler syringes; CTD's; u/w mass spectrometer; hydraulically driven rotary sample storage trays; electro shocking systems;

- *Fabrication, installation, testing, & personnel training* for the underwater habitat/saturation system "Hydrolab".
- *Design and fabrication* of 1) a 6500m arctic tow sled (CAMPER) w/design and installation of the vehicle hydraulic systems, suction sampler, and grab sampler; 2) the new science tool sleds for Jason 2 ROV and SOC ROV, which included two hydraulically actuated, side mounted swing arms with 180 degree rotation, and a large hydraulically actuated forward sample basket; and 3) deep-sea elevators for the Jason 2 ROV and DSV Alvin, including testing.
- *Initial design and NSF proposal preparation* for new rotary suction sampler built for 1) Jason 2 ROV, 2) DSV Alvin, and 3) the British SOC ROV.
- *Member of technical design team* for building ROV "Hercules".

Products

R. Sohn, R. Harris, C. Linder, K. Luttrell, D. Lovalvo, L. Morgan, W. Seyfried, P. Shanks, Exploring the Restless Floor of Yellowstone Lake, Eos, 98, https://doi.org/10.1029/2017EO087035, 2017.

T. Gregory, T., D. Lovalvo, B. Mohr, K. McLetchie, M. Ryan. Advancing Undersea Technology. *Oceanography Supplement: New Frontiers in Ocean Exploration*, March 2016, Volume 29, No. 1. http://tos.org/oceanography/issue/volume-29-issue-01-supplement

Lovalvo, D., S.R. Clingenpeel, R.E. Macur, W.P. Inskeep, J. Glime, J. Varley, K. Nealson, and T.R. McDermott. March 2010. A geothermal-linked biological oasis in Yellowstone Lake. *Geobiology*. 8:327–336. http://onlinelibrary.wiley.com/doi/10.1111/j.1472-4669.2010.00244.x/full

Morgan LA; Shanks WC, III; Lovalvo DA; Johnson SY; Stephenson WJ; Pierce KL; Harlan SS; Finn CA; Lee G; Webring M; Schulze B; Duehn J; Sweeney RE; Balistrieri LS. 2003. Exploration and discovery in Yellowstone Lake; results from high-resolution sonar imaging, seismic reflection profiling, and submersible studies. Journal of Volcanology and Geothermal Research, v.122, no.3-4, pp.221-242.

Synergistic Activities

Past Affiliations: Institute for Exploration (IFE): Adjunct in Engineering; URI (Dept of Ocean Engineering): Visiting Scholar; Woods Hole Oceanographic Institution: Adjunct in Engineering.

Professional Licenses: Professional Training: Commercial Deep Sea, Mixed Gas/Saturation, Shallow Water, and Instructor Dive Certifications; 2) Alvin Deep Diving Submersible: Certified by USN and Woods Hole Oceanographic Institution (Inactive); 3) US Coast Guard: Unlimited Passengers/ 100 Gross Tons; 4) Master Electrician: National Electrical Code